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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/710,870	08/09/2004	Dennis W. Prather	00131-00322-US1	4869

30678 7590 08/26/2005

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EXAMINER	
LEE, CALVIN	
ART UNIT	**PAPER NUMBER**
2818	

DATE MAILED: 08/26/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/710,870	PRATHER et al.	
	Examiner	Art Unit	
	Lee, Calvin	2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 August 2005 (Remark)*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-10* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

FINAL ACTION

Claim Rejections - 35 U.S.C. § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office Action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-3 and 5-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Lin et al (US 5,587,342)* in view of *Ichikawa et al (US 6,534,422)*.

a) *Lin et al* discloses a method for fabricating a flip-chip semiconductor device having plural conductive polymer bumps thereon, comprising the steps of:

-patterning and depositing metallized pads **12** on a substrate **10** [col. 2, ln.41];

-photolithographically forming plural molds **15** on the substrate using a photoresist, wherein the plural molds are in registration with the metallized pads [Fig. 1];

-filling the molds by applying a low viscosity conductive polymer material **30** [Fig. 2 and col. 3];

-baking the whole structure to thicken any remaining conductive polymer material and evaporate any solvent in the conductive polymer layer [col. 4, lns.17-34];

-polishing the conductive polymer layer to remove excess conductive polymer material from a surface of the photoresist [Figs. 3-4 and col. 4, ln.14];

-stripping the molds to reveal the polymer bumps **30** [Fig. 7 and col. 4, ln.38]

-and hardening the plural conductive polymer bumps by temperature curing [col. 4, ln.58].

b) In re claims 2-3, *Lin et al* also discloses, "wet photoresist layer **15** may be a negative or positive resist ...which allow the formation of openings or vias **20** therein" [col. 2, ln.61].

c) In re claims 5 and 7-9, *Lin et al* discloses "curing ... in an oven having a temperature of 120°C-140°C for approximately 5-10 minutes;" "curing would take place at a temperature slightly higher than the solder's eutectic temperature, which is typically higher than 100°C-350°C" [col. 4]

d) In re claim 6, *Lin et al* discloses "photoresist stripper is used to remove wet photoresist **15**"

e) In re claim 10, since Lin et al discloses, "to form electrical contacts having a width or diameter of 50 microns or less" [col. 2, ln.30], *Lin et al* inherently teaches or suggests a semiconductor device having high aspect ratio.

f) *Lin et al* suggests dispensing, spreading, or flooding the polymer on the substrate, but not spinning it. Nevertheless, such spinning technique is known in the semiconductor flip-chip art as evidenced by *Ichikawa et al* disclosing, "the conductive polymer is applied in liquid form on the wafer surface using a silk-screen printing process or a spin-on process and then cured" [Abstract].

It would have been obvious to one with ordinary skill in the specific art to modify the polymer fill of *Lin et al* by utilizing a spinning technique for the purpose of uniformly depositing a polymer layer on the preformed photoresist.

3. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over *Lin et al* in view of *Ichikawa et al*, as applied top claim 1, and further in view of *Slutz et al (US 2005/0025973)*.

Lin et al suggests polishing/removing excess polymer using a flat pad **50**, but not fine polishing the conductive polymer layer using a grid having a smaller grain size. *Slutz et al* discloses "a polishing pad ... having an average grain size ranging from about 1 to about 15 microns" [¶ 0033-0034]. The examiner notes that it is notorious to use a polishing pad having a smaller grain size for the purpose of obtaining a polished layer having a smoother surface.

Response to Arguments

4. Applicants' argument that "*Lin et al* nowhere discloses ... polishing the conductive polymer layer to remove excess conductive polymer material from a surface of the photoresist" is unpersuasive. *Lin et al* with the statement "the surface of the conductive paste 30 is planer ... having substantially the same height" in col. 4 and Fig. 4 inherently teaches the well-known step of polishing the conductive polymer layer to remove excess conductive polymer material from a surface of the photoresist.

Applicants also argued "*Ichikawa et al* nowhere discloses ... polishing the conductive polymer layer to remove excess conductive polymer material from a surface of the photoresist." The Examiner notes that *Ichikawa et al* here is used to overcome the deficiencies of *Lin et al* with regard to the claim limitation of "spinning the substrate to form a uniform distributed conductive polymer layer." Same as to *Slutz et al* used to overcome the deficiencies of *Lin et al* with regard to the claim limitation of "a grid having a smaller rain size."

Note in the above rejections, the specific portions of *Lin et al* in view of *Ichikawa et al* have been pointed out in detail. Therefore, a rejection above has been made FINAL.

5. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire three months from the mailing date of this action. In the event a first reply is filed within two months of the mailing date of this final action and the advisory action is not mailed until after the end of the three-month shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than six months from the date of this final action.

Contact Information

6. Any inquiry concerning this communication from the Examiner should be directed to *Calvin Lee* at (571) 272-1896 on Mondays thru Thursdays 6:30-4:30PM. If attempts to reach the examiner by telephone are unsuccessful, Art Unit 2818's Supervisory Patent Examiner *David Nelms* can be reached at (571) 272-1787. The fax phone number for the organization (where this application is assigned to) is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system at http:/pair-direct.uspto.gov. Should you have questions on access to the PAIR system, contact the Electronic Business Center at (866) 217-9197.

CL

Date: August 24, 2005

David Nelms
Supervisory Patent Examiner
Technology Center 2800